

Claims

- [1] 1. An acryl-silicone hybrid impact modifier comprising:
0.01 to 10 parts by weight of a seed composed of the copolymer of a vinyl monomer and a hydrophilic monomer;
60 to 94 parts by weight of an acryl-silicone hybrid rubber core; and
6 to 40 parts by weight of a shell containing alkyl methacrylate.
- [2] 2. The acryl-silicone hybrid impact modifier according to Claim 1, wherein said seed is comprised of 60 to 99 parts by weight of a vinyl monomer, 0.5 to 30 parts by weight of a hydrophilic monomer, and 0.5 to 5 parts by weight of a cross-linking agent.
- [3] 3. The acryl-silicone hybrid impact modifier according to Claim 2, wherein said vinyl monomer is one or more kinds of compounds selected from the group consisting of styrene, α -methylstyrene, vinyl toluene, and 3,4-dichlorostyrene.
- [4] 4. The acryl-silicone hybrid impact modifier of Claim 2, wherein said hydrophilic monomer is one or more kinds of compounds selected from the group consisting of alkyl acrylate such as ethylacrylate, butylacrylate, 2-ethylhexylacrylate, etc.; alkyl methacrylate such as methylmethacrylate, benzylmethacrylate, etc.; acrylonitrile; hydroxymethylmethacrylate; and glycidylmethacrylate.
- [5] 5. The acryl-silicone hybrid impact modifier according to Claim 1, wherein said acryl-silicone hybrid rubber core is comprised of 55.0 to 97.5 parts by weight of an acrylic rubber core, and 2.5 to 45.0 parts by weight of a silicon rubber core.
- [6] 6. The acryl-silicone hybrid impact modifier according to Claim 5, wherein said acryl rubber core is comprised of 97.0 to 99.9 parts by weight of an alkyl acrylate of which alkyl group has 1 to 8 carbon atoms, and 0.1 to 3.0 parts by weight of a cross-linking monomer.
- [7] 7. The acryl-silicone hybrid impact modifier according to Claim 6, wherein said alkyl acrylate is one or more kinds of compounds selected from the group consisting of methylacrylate, ethylacrylate, propylacrylate, iso-propylacrylate, butylacrylate, hexylacrylate, octylacrylate, and 2-ethylhexylacrylate.
- [8] 8. The acryl-silicone hybrid impact modifier according to Claim 5, wherein said silicone rubber core is comprised of:
90.00 to 99.65 parts by weight of a cyclic organosiloxane having 3 to 7 rings;
0.1 to 5.0 parts by weight of an organosilane cross-linking agent having 1 to 4

alkoxy functional groups; and

0.25 to 5.0 parts by weight of an organosilane graft-linking agent having an alkyl acrylate or methacrylate that may be readily radical-polymerized with 1 to 3 alkoxy functional groups, mercaptane, and 0 to 2 alkyl groups.

- [9] 9. The acryl-silicone hybrid impact modifier according to Claim 8, wherein said cyclic organosiloxane is one or more kinds of compounds selected from the group consisting of hexamethylcyclotrisiloxane, octamethylcyclotetrasiloxane, decamethylcyclotetrasiloxane, dodecamethylcyclotetrasiloxane, trimethyltriphenylcyclotrisiloxane, tetramethyltetraphenylcyclotetrasiloxane, and octaphenylcyclotetrasiloxane.
- [10] 10. The acryl-silicone hybrid impact modifier according to Claim 8, wherein said organosilane cross-linking agent is one or more kinds of compounds selected from the group of trimethoxymethylsilane, triethoxymethylsilane, triethoxyphenylsilane, tetramethoxysilane, tetraethoxysilane, tetranormal-propoxysilane, and tetrabuthoxysilane.
- [11] 11. The acryl-silicone hybrid impact modifier according to Claims 2 or 6, wherein said cross-linking monomer is one or more kinds of compounds selected from the group consisting of divinylbenzene, 3-butanediol diacrylate, 1,3-butanediol dimethacrylate, 1,4-butanediol diacrylate, 1,4-butanediol dimethacrylate, allylacrylate, arylmethacrylate, trimethylolpropane triacrylate, tetraethyleneglycol diacrylate, and tetraethyleneglycol dimethacrylate.
- [12] 12. The acryl-silicone hybrid impact modifier according to Claim 1, wherein said alkyl methacrylate is an alkyl methacrylate of which alkyl group has 1 to 4 carbon atoms.
- [13] 13. The acryl-silicone hybrid impact modifier according to Claim 1, wherein said shell additionally includes 0.1 to 20 parts by weight of an aiding monomer which is one or more kinds of compounds selected from the group consisting of methylacrylate, ethylacrylate, butylacrylate, acrylonitrile, and methacrylonitrile based on the total monomers of the shell of 100 parts by weight.
- [14] 14. The acryl-silicone hybrid impact modifier according to Claim 1, wherein the glass transition temperature of said acryl-silicone hybrid rubber core is -120 °C to 25 °C .
- [15] 15. The acryl-silicone hybrid impact modifier according to Claim 1, wherein said acryl-silicone hybrid rubber core has a morphology in which a discrete poly-organosiloxane rubber phase is dispersed locally onto the inner part and surface

of a continuous acrylic rubber core.

[16]

16. A method of manufacture of an acryl-silicone hybrid impact modifier comprising the steps of:

a) manufacturing a seed latex through a cross-linking reaction by emulsion polymerization of an emulsion solution containing 0.01 to 10 parts by weight of a seed (based on the weight of an impact modifier monomer) composed of 65 to 99 parts by weight of a vinyl monomer, 0.5 to 30 parts by weight of a hydrophilic monomer, and 0.5 to 5 parts by weight of a cross-linking monomer; b) manufacturing an acrylic rubber core latex through emulsion polymerization by adding an emulsion solution containing 55.0 to 97.5 parts by weight of an acrylic rubber core (based on the weight of an acryl-silicone hybrid rubber core), composed of 97.0 to 99.9 parts by weight of an alkyl acrylate of which alkyl group has 1 to 8 carbon atoms and 0.1 to 3.0 parts by weight of a cross-linking monomer, to said seed latex;

manufacturing a silicone rubber core precursor comprised of 90.00 to 99.65 parts by weight of a cyclic organosiloxane containing 3 to 7 rings; 0.1 to 5.0 parts by weight of an organosilane cross-linking agent containing 1 to 4 alkoxy functional groups; and 0.25 to 5.0 parts by weight of an organosilane graft-linking agent having alkyl acrylate or methacrylate which may be readily radical-polymerized with 1 to 3 alkoxy functional groups, mercaptane, and 0 to 2 alkyl groups; Manufacturing an acryl-silicone rubber core latex by swelling 2.5 to 45.0 parts by weight of said silicone rubber core precursor (based on the weight of said acryl-silicone hybrid rubber core) and performing a condensation reaction at a reaction temperature of 60 °C to 100 °C with an acidic catalyst; and

c) manufacturing an acryl-silicone hybrid impact modifier latex by forming a hard shell onto the outside of the rubber core through emulsion graft polymerization by adding an emulsion solution containing 6 to 40 parts by weight of alkyl methacrylate of which alkyl group has 1 to 4 carbon atoms (based on the weight of an impact modifier monomer) to 60 to 94 parts by weight of said acryl-silicone rubber core latex (based on the weight of said impact modifier monomer).

[17]

17. The method of manufacture of said acryl-silicone hybrid impact modifier according to Claim 16 further including a step of obtaining the impact modifier powder through coagulation of said acryl-silicone hybrid impact modifier latex obtained in said Step c) with an electrolyte, organic acid, or inorganic acid at a

temperature of 0 °C to 100 °C , filtering, and drying.

- [18] 18. The method of manufacture of said acryl-silicone hybrid impact modifier according to Claim 16 further including a step of obtaining the impact modifier powder through spray-drying by introducing a sodium alkyl sulphate solution to said acryl-silicone hybrid impact modifier latex obtained in said Step c) and mixing with a flow aid simultaneously under the operational conditions of a chamber inlet temperature of a spray-dryer of 135 °C to 225 °C , a chamber outlet temperature of 30 °C to 90 °C , and a rotary rotation speed of 5,000 rpm to 30,000 rpm.
- [19] 19. The method of manufacture of said acryl-silicone hybrid impact modifier according to Claim 18, wherein said flow aid is one or more kinds of compounds selected from the group consisting of calcium carbonate surface-coated with stearic acid or metallic stearic acid, clay, silica, titanium oxide, and a methacrylic copolymer.
- [20] 20. A vinyl chloride resin comprising 80 to 99 parts by weight of a vinyl chloride resin, and 1 to 20 parts by weight of said acryl-silicone hybrid impact modifier of Claim 1.